

THE PATHOGENIC COLON*†

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THE occasional hereditary transmission of certain psychopathic disorders, including epilepsy, has long been an acknowledged fact. The mechanism of transmission has remained an enigma. From time out of mind the inheritance of epilepsy and the so-called functional psychoses has been accepted as an inescapable yoke, passing from generation to generation, and because of our age-old dualistic habit of separating the mind or soul from the body, and of our ignorance concerning the basic laws of heredity it sufficed loosely to concede the transmission of these disorders to the mind. This popular trend of thought away from Virchow savors of mystery and medieval medicine. It is not new. Of all the ancients, the Greeks alone rejected it.¹ From the modern biological point of view such an explanation is inadequate. One has only to read Conklin² or Morgan,³ or to believe in Virchow, to be convinced that since there can be no function of any kind without form just so surely there can be no abnormal function without abnormal form. The origin of abnormality in cerebral cellular form is of necessity either congenital or acquired. It is with the acquired or secondary form that we are concerned, because here an hereditary element which may respond favorably to surgical treatment is often to be found within the abdomen.

The primary or congenital cerebral abnormalities are worthy of more than passing consideration, even though in a biological sense we cannot expect to modify them. Much careful research has been made upon these primary abnormalities of the brain, and it has long since been demonstrated that definite forms of idiocy result from gross and easily recognized congenital cerebral defects. Less severe abnormalities account for the ordinary moron and the so-called constitutional defective. Their symptoms appear soon after birth and post-conceptional environment cannot materially change or improve them.

The secondary or toxic form of cerebral cellular disorder is to be found in those adolescent individuals who have been bright and normal since birth and who have suddenly developed epilepsy or a so-called functional psychosis. The family history may be entirely negative, save that it points frequently to chronic intestinal invalidism. The personal history and physical findings often demonstrate extensive chronic focal infection throughout the body, and not infrequently what has been called a "surgical abdomen." Should such patients, because of mental disturbance, be denied a thorough medical examination and surgical defocalization such as is practiced everywhere for the

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relief of many common disorders? Wertheimer,⁴ in discussing American psychiatry, disposes of the question as follows: "The numerous operative procedures represent a degeneration of the pragmatic attitude." Insanity in this country has increased 468 per cent. since 1880, while our population has increased 112 per cent.⁵ May it not be that our failure to check this rising tide of human waste is due in large part, not only to defects in the established methods of treatment, but also to the utter lack of a comprehensive and biologically correct preventive program? The effect of heredity upon the incidence of insanity is not definitely known, but we do know that in some patients hereditary factors exist which predispose to bacterial or other forms of toxicosis, and which are susceptible to surgical intervention. Surely the physical and biological side should not be lost to view in the present effort to stress psychical therapeutics, for there is no reason why the two forms of study and treatment should not be combined.

The hereditary transmission of intra-abdominal defects is today an unexplored field, but it is probable that it conforms to the Mendelian law. Recent study shows that such defects, notably of the colon and omentum, are of frequent occurrence among psychotic and epileptic patients and that they favor the development of an abnormal and destructive flora in the colon. They may also offer a satisfactory explanation of the mechanism which transmits neuro-psychoses in certain families not known to harbor primary cellular defects of the brain. No one can successfully deny that in such families there may be slight congenital abnormalities in the cerebral cells and that these, although not demonstrable, may be present without causing symptoms excepting when complicated by the toxins of focal infection. The sources of these toxins are demonstrable and will yield to surgical and medical therapeutics. Primary defects of the brain, if present, cannot be changed by treatment. The questions of tissue susceptibility and bacterial specificity are of the utmost importance, but beyond the scope of this paper.

A colon dysmorphism due to congenital bands and other developmental abnormalities is incompatible with the gravitational drag of the upright posture and is therefore unfavorable to the continuance of the water and gas-tight colon with which we are born. For such dysmorphisms, seemingly hereditary, often cause partial obstruction, abrasions and pressure traumatism to the colon tissues, resulting in permeability, destructive ulceration, chronic peritonitis and the symptoms of chronic intestinal invalidism. Davenport,⁶ commenting upon certain of the histories and findings pursuant to this research, says: "While not yet definitely proven, these studies upon the possible transmission of dysmorphism in the human colon in families are of very great interest and importance. I regard them as a valuable addition to our general knowledge regarding the relationship of heredity and environment, and am therefore publishing a part of your report in the *Eugenical News*." ⁷

Of the one hundred and seventy-six cases analyzed in this report, and

exclusive of the group of one thousand referred to later, one hundred and sixty-four are from the surgical clinic and the laboratory of the State Hospital for the Insane at Trenton, New Jersey. Of this group, one hundred and forty-nine were psychotic and fifteen were epileptic. The remaining cases were taken from the private files of the writer, and in addition to epilepsy deal with the more generalized symptoms of chronic invalidism. The surgical analysis of the State Hospital cases was made by John W. Churchman, who at the time was in charge of the hospital laboratory. The work as a whole has been under the direction of Henry A. Cotton.

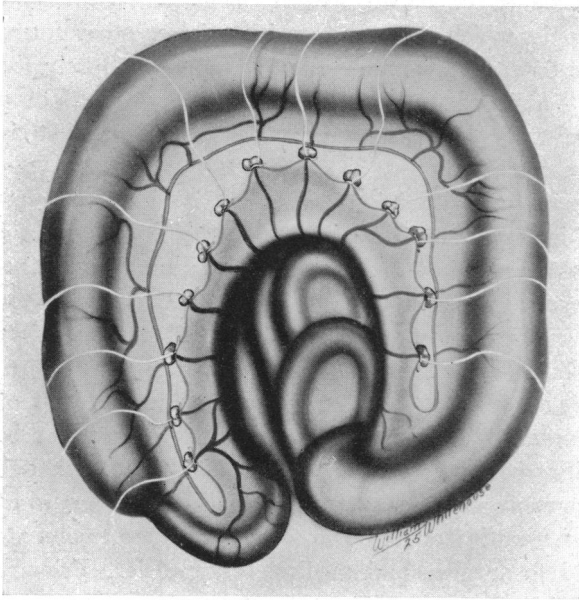


FIG. 1.—Method for closing mesenteric defect and sealing retro-peritoneal space.

From a careful study of the functional psychotic group admitted to the State Hospital during the past eight years, it is evident that each patient presents a greater or less degree of focal infection throughout the body, and that serious lesions of the colon exist in fully 30 per cent. The great majority of these lesions are due to dysmorphisms of the congenital type, the remainder to deformities of inflammatory origin alone. Both causes are often present concurrently. Four years ago James Ewing⁸ examined sixteen specimens of colon and ileum chosen at random from the material under discussion. He says: "The great majority of the specimens show very definite gross anatomical lesions. . . . The most marked is pigmentation, excessive in the cæcum, but often present throughout the specimen. This pigmentation is fully recognized as a sign of chronic intestinal stasis and intoxication. It is sometimes associated with anemia, and at times with severe and even fatal dystrophies of the nervous and muscular systems.

"Pouching of the intestinal wall amounting almost to hernial protrusions was observed in most of the cases. The wall was sometimes very much thinned, and the mucosa at the bottom was generally eroded, sometimes ulcerated. Through such erosions it is obvious that absorption of fluids and bacteria readily occurs.

" . . . In general the impression gained from the study of these specimens was that the clinicians were dealing with extensive and somewhat unusual

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grades of chronic intestinal stasis and catarrhal inflammation with its sequels. . . . Important is the demonstration of hernias, pouching, thinning of wall, pigmentation and ulceration of the mucosa, which together form an impressive anatomic basis for the theory of intestinal intoxication, which undoubtedly existed in severe degree in the cases exhibiting such lesions."

Doctor Ewing's full report, from which the above is abstracted, is an important document. These details are offered to explain something of the hypotheses which have served as guides in the study of the present series and to show that this work upon the colon far from being haphazard, has been carefully coördinated with well established biological laws and with conservative laboratory findings.

The colon specimens belonging to this group, and from which Doctor Ewing's studies were made were removed by the usual technic. It comprised a closure of the peritoneum across the pelvis. This obliterated the mesenteric defect between the termination of the ileum and of the sigmoid, but it necessitated

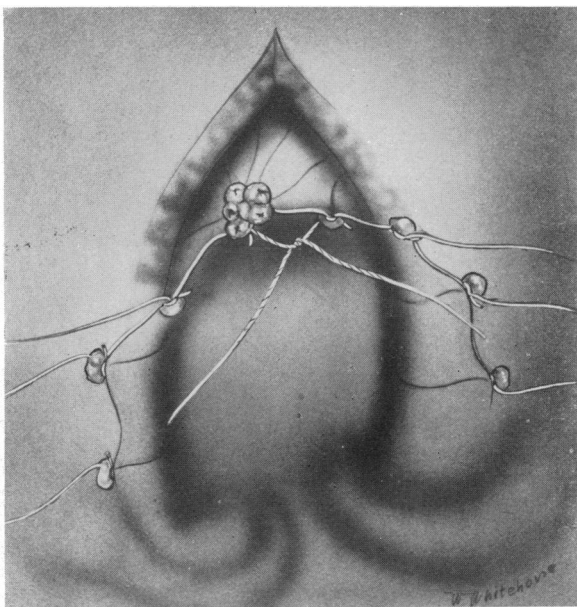


FIG. 2.—Method of tying the interrupted sutures.

evisceration in order to dislocate the small bowel from the pelvis and often led to post-operative complications. Its most objectionable feature, however, appears to have been that the long suture line extending over the entire area of extirpation was incompletely closed. Coffey⁹ has recently published a method illustrating its closure. The pertinent mortality in the hospital series of one hundred and sixty-four cases was 31.7 per cent. As this was seriously high the technic has been changed as follows: The colon mesentery is left as long as possible and the suture ends are gathered together as shown in Figs. 1 and 2. The mesenteric defect between the terminal ileum and the terminal sigmoid is then closed as shown in Fig. 3. The result of this is to shut off almost completely the entire retroperitoneum, which under the older technic had been left relatively open to infection. The heterostaltic lateral anastomosis is used as heretofore. Since the introduction of this simple change the pertinent mortality in an unselected continuous series of twenty-five hospital and private cases has fallen to 16 per cent. E. C.

Dudley,¹⁰ commenting upon the resemblance of the mesenteric closure to his own well-known approximation of the pelvic floor after hysterectomy, and which is generally credited with having reduced the mortality of that operation by fully 20 per cent., has said that, employed as above described, it would, in his opinion, ultimately result in lowering the mortality of total colectomy to less than 5 per cent. To Doctor Dudley I am deeply indebted for constructive criticism.

The general problem of the pathogenic colon and its treatment, although

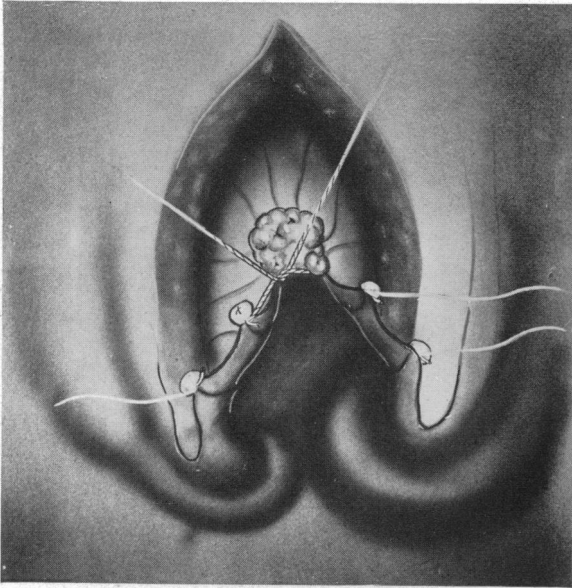


FIG. 3.—Mesenteric closure nearly completed, and retroperitoneum shut off.

recognized as important, is as yet little understood. The following tentative conclusions, based upon study of this series, may therefore be of some value.

Chronic peritonitis, manifested by cicatricial scars upon the mesentery and associated with the breaking down of mesenteric glands, is frequently present. It does not cause much pain and is not associated with fever. It is related to the low blood pressure and hæmic changes reported by Draper and Johnson,¹¹

and is probably the direct result of leakage of bacteria and their toxins through the mechanically damaged colon, as cited by Ewing. Indeed if at operation the serous surface of such a colon is gently stroked after a rectal injection of acriviolet the dye can be observed to ooze through the bowel wall.

Acquired post-operative adhesions are rarely found after a colectomy unless there has been leakage from the stoma. They are more frequently of infectious than traumatic origin. An abdomen which was found at primary operation for colectomy to be filled with adhesions has been observed to be entirely free from them in spite of having been opened seven times (Case 4931).

Chronic diffuse proliferative adenitis is a constant and valuable clinical sign of colonic leakage. It is often segmental in distribution, corresponding closely to the position of the intrinsic colon lesion. The glands usually contain living *B. Coli* and streptococci. Accidental gland section during the laparotomy may account occasionally for post-operative peritonitis.

Omental dysmorphism frequently causes partial obstruction and also axial

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rotations of the colon. The bilateral symmetry of omental abnormalities is noteworthy. When the omentum is adherent in the right abdominal gutter it is likely to be adherent in the left. (Figs. 4 and 5.)

Partial intestinal obstruction is of two types. Barber¹² has demonstrated the effect of complete and incomplete mechanical occlusion in the ileo-colic region upon the neuromuscular control of the pylorus, and Satterlee¹³ more recently has published clinical studies upon the causation of abnormal gastro-intestinal reflexes by rectal atresia. Since 1903, obstruction has been the subject of intensive and prolonged study on the part of the writer. Murphy,¹⁴ Whipple,¹⁵ Dragstedt,¹⁶ recently and in great detail, Eisberg,¹⁷ and finally Brown, Eustermann, Hartman and Rowntree¹⁸ have continued this work. Andrew Todd McClintock¹⁹ in 1917, noted another phase of the relationship between the terminal ileum and the duodenum. He says, "A sub-culture injected intravenously in rabbits caused intense hemorrhages of the duodenum, jejunum and appendix."

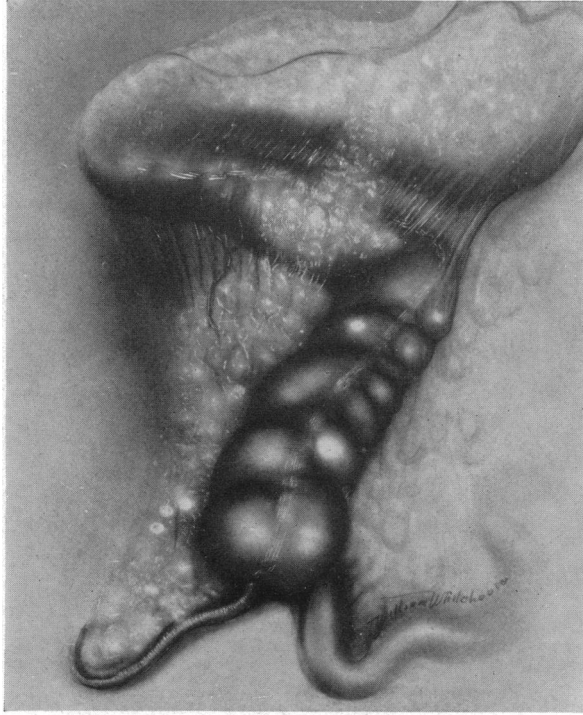


FIG. 4.—Right omental deviant.

It is extremely significant that McClintock's findings based upon the reaction to bacterial suspension coincided with those of Barber and Satterlee which resulted from clinical study.

The source of the toxicosis accompanying duodenal obstruction is not yet definitely known, but the hypothesis advanced by the writer²⁰ in 1906, that a part of it at least is not of bacterial origin, but is elaborated by the duodenal epithelium, still remains to be disproven. Indeed the recent work of Miller and Raulson,²¹ who consider epilepsy as a manifestation of anaphylaxis, appears to be somewhat in harmony with it. Some of the lethal product may arise from anaërobic bacteria, as suggested in the study of Draper's material by Torrey²² who has demonstrated the presence of *bacillus histolyticus*. Whatever its source, it is probable that in every definite case of partial ileo-colic mechanical obstruction there is an associated and often unrecognized compensatory duodenal functional obstruction. This results in a complicating

endotoxemia from the duodenal epithelium which directly affects the brain. Hassin,²³ in his monograph on multiple sclerosis, considers it due to some unknown toxin, probably an endotoxin. In this connection attention is directed to the first paragraph of Ewing's report and also to Cotton's Van Uxem Lectures.²⁴

Constipation is a frequent sequel of partial obstruction. It is primarily protective. A less frequent sequel, and one in which some of the worst evidences of colonic toxemia have been observed, is diarrhœa. This is often a

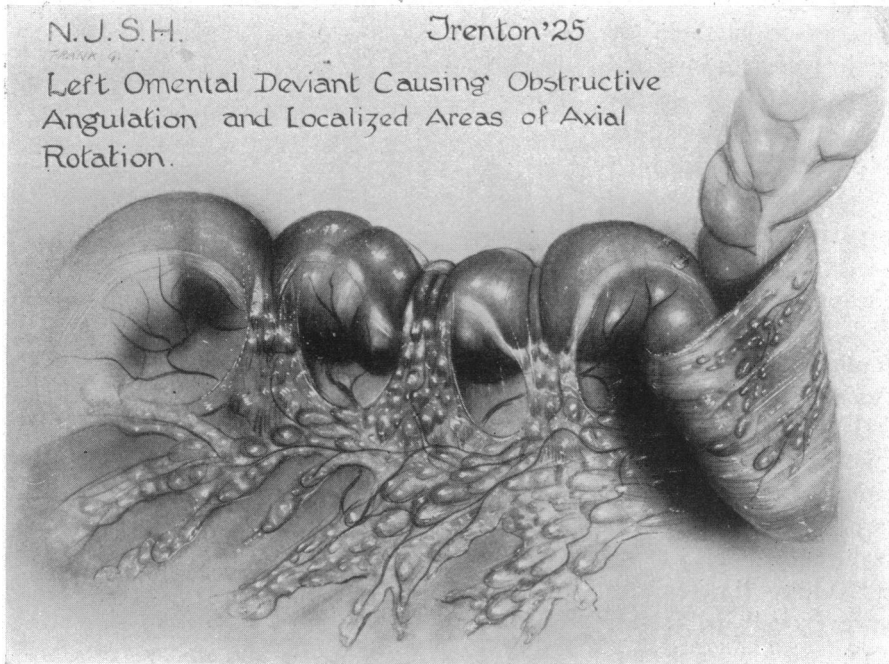


FIG. 5.—Typical congenital defect found at operation.

form of paradoxical incontinence, the bowel pouches remaining full of hard feces.

Short-circuiting.—Blake and Brown,²⁵ studying hemi-exclusion in laboratory animals, first demonstrated conclusively the impracticability of unilateral exclusion. Nevertheless such exclusions are still occasionally resorted to. Following ileo-sigmoidostomy the hemi-excluded colon becomes enormously distended, owing to the predominance of the anastaltic waves. Fig. 6 shows the pathological changes occurring in a loop created without option by the writer four years ago and recently removed. It was found to be filled with a foetid red fluid containing a few solid particles and much hæmolyzed blood. For six months prior to the final resection the patient had averaged fifteen small stools daily, similar in character to the contents of the loop and presumably originating therefrom. Since excision the diarrhœa has ceased, and with it the so-called neurasthenia. The principle of short-circuiting is wrong because

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it fails to take into consideration the invariable rule that the effluent will not pass through a lateral entero-anastomosis unless the normal path just aboral to it is blocked. The principle of hemi-exclusion is wrong in that it fails to overcome the effect of anastalsis.²⁶ Moreover, a leaking colon is left *in situ*.

Physiological Effects of Total Colectomy.—Thirst is almost always an immediate post-operative condition. It is not only painfully uncomfortable but seriously detrimental. It is due to the fact that practically all of the water absorbing surface has been removed. Hypodermoclyses of large quantities of one-half and even one-quarter strength salt solution have been used without ill effect or pain.

It may be injurious to the kidneys to inject large amounts of sodium chloride. Immunity to toxic foods may occur. Colectomized patients sometimes state that they are not made sick by the accidental eating of tainted meat or other food which has poisoned others. Diarrhœa, amounting to from ten to fifteen watery movements daily, always gradually ceases in from two to three weeks as the terminal ileum takes on vicariously the water absorbing function of the excised colon. Increase in weight is to be ex-

pected after the water privation has ceased. The somewhat prevalent idea that patients are likely to have chronic diarrhœa and to lose weight is shown by a study of this series to be entirely erroneous.

Relationship of the Pathogenic Colon to Neuro-mental Symptoms.—From a study of this group of one hundred and sixty-four patients in whom colectomy either alone or combined with other forms of defocalization has been done the relief of symptoms in a fairly large percentage of the cases strongly indicates a connection between toxic factors and the functional psycho-neuroses. This conclusion is based upon the striking disappearance of symptoms shortly after operation and their continued absence for a period of several years under competent field observation. Even allowing for the remissions for which the functional psycho-neuroses including epilepsy are notorious, and for the cases in which there has been little or no change, a group remains in which there has been either complete arrest or very marked

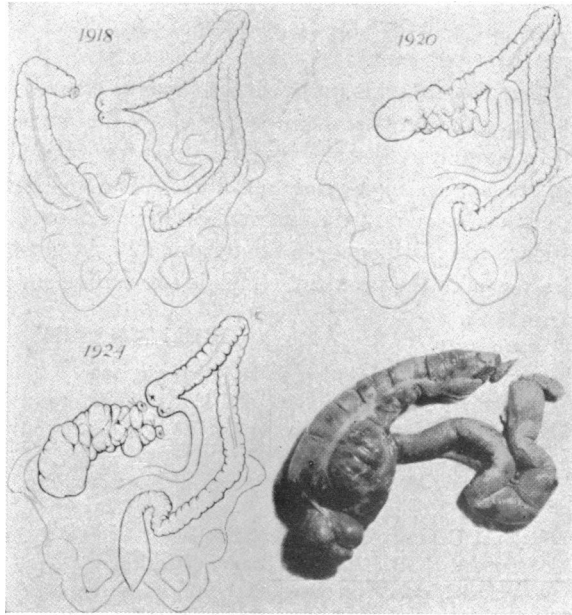


FIG. 6.—Pathologic changes in loop of intestine excluded four years ago and recently removed.

improvement. Two analogous groups comprising one thousand patients among the so-called functional psychotics were investigated at the State Hospital. One group of five hundred consecutive admissions between 1908 and 1911 was treated without detoxication. The other group of five hundred consecutive admissions between 1918 and 1920 was treated by detoxication. Of this latter group only eighty remained in the hospital at the end of five years (16 per cent.), while of the former group two hundred and fifty-six remained at the end of a similar period (51 per cent.). The recovery rate in the detoxicated group was 2.3 times that of the untreated group, the ratio being one hundred and forty to three hundred and twenty-eight. The mortality in the detoxicated group was 13 per cent., while in the untreated group it was 13.2 per cent.²⁷

Finally, it seems probable that dysmorphisms of the colon and omentum are dominant, and that this in part explains the occasional hereditary transmission of certain nervous and mental disorders and their apparently spontaneous occurrence in high-grade families. The discovery and correction of such intestinal and omental anomalies in childhood, before the colon has been permanently damaged, is unquestionably the first and most important step in dealing with the problem. This is preventive surgery.²⁸

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